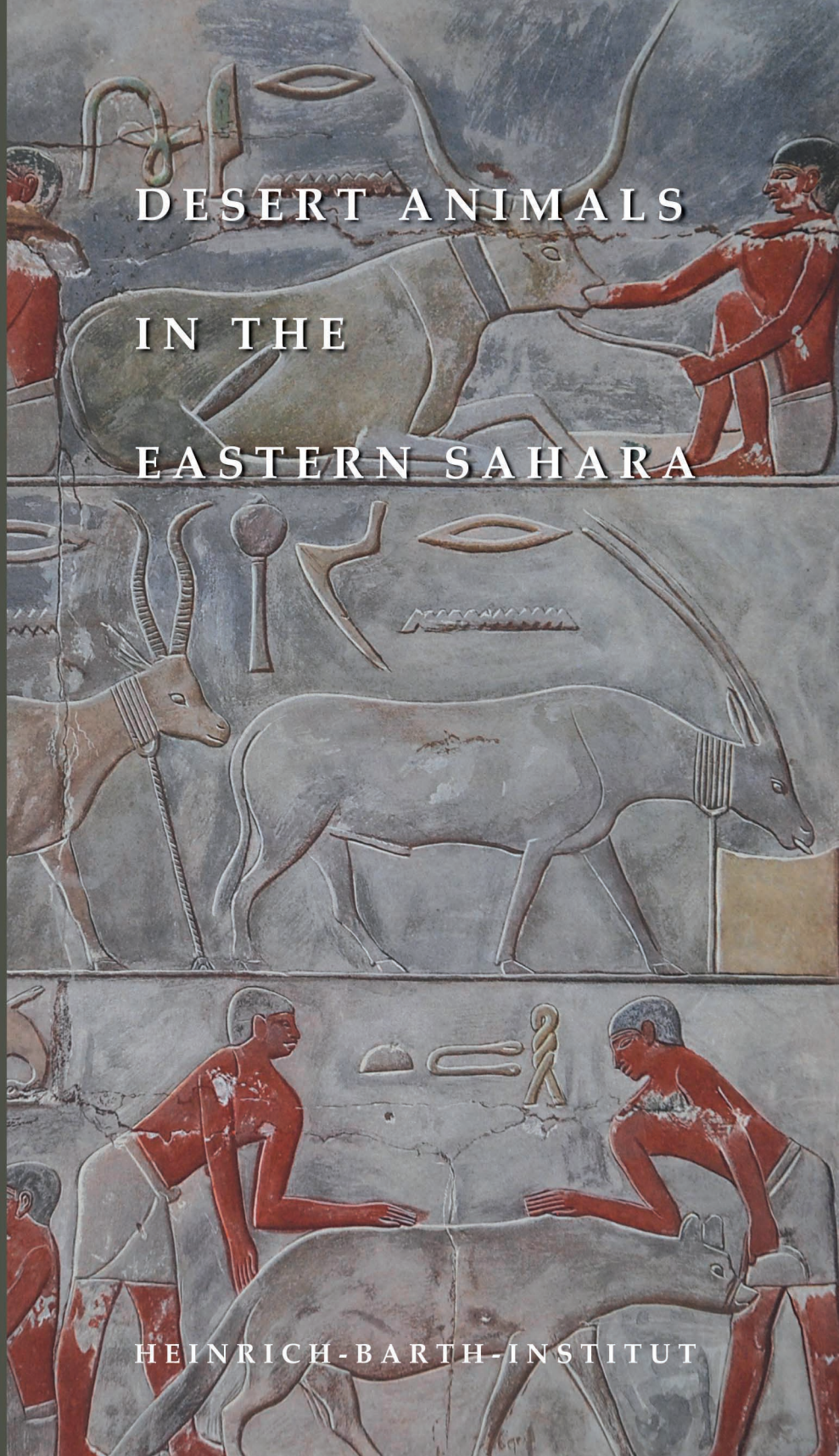




DESERT ANIMALS IN THE EASTERN SAHARA



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The prehistoric gamebag: The archaeozoological record from sites in the Western Desert of Egypt

Abstract

The faunal remains from Holocene sites in the Western Desert of Egypt form the basis of this contribution. Following considerations concerning taphonomy, the wild species' composition of the assemblages is discussed in a diachronic overview. Major changes in the preferences of game species could not be observed. Subsistence strategies, however, show a prominent shift in the youngest period (from c. 3500 BC onwards): Hunting now lost its former importance with the introduction of livestock. Due to deteriorating environmental conditions, the Nile Valley became more attractive and the desert was gradually depopulated. New (temporary) settlement types were established in the desert: resting stations and watch posts along travel and trading routes as well as temporary camps of oasis dwellers in the desert outside the oases. These sites show that hunting still was an important activity in the desert, but was practised now either in an opportunistic manner, or to produce goods for exchange or trade. Finally, the picture gained by studying the osseous remains from desert sites is compared to that provided by ancient Egyptian iconographic data.

Keywords: Archaeozoology, Egypt, Western Desert, Holocene, Prehistoric, Dynastic, desert game, subsistence strategies, trade

1. Introduction

'Desert animals' is a fixed term in Egyptology and relates to the wild animals that are brought to the pharaoh and dignitaries of the Egyptian state in long processions or that are hunted by them or their subordinates in the desert (Boessneck 1988: 35). The preferred species depicted are: scimitar-horned oryx, *Oryx dammah*; hartebeest, *Alcelaphus buselaphus*; addax, *Addax nasomaculatus*; dorcas gazelle, *Gazella dorcas*; Nubian ibex, *Capra ibex nubiana*; and, to a lesser degree, Barbary sheep, *Ammotragus lervia* (Boessneck 1988: 36). As shown by the depictions these animals were either hunted or captured and afterwards kept in enclosures or stables (see Herb & Förster, this volume; Linseele & Van Neer, this volume). Boessneck (1988: 36) has already stated that these pictures do not represent the reality accurately but show idealised traditions of funeral rites. However, many animals displayed in ancient Egyptian wall paintings and reliefs still roamed the land bordering the Nile Valley oasis and were certainly part of the common experience of ancient Egyptians during predynastic and dynastic times. This contribution will give an overview of the archaeozoological record from Western Desert sites chronologically

prior and, in some cases, contemporary to the ancient Egyptian depictions in order to complete the picture given by the iconographic and textual sources (Herb & Förster, this volume) and the faunal record from Nile Valley sites (Linseele & Van Neer, this volume).

2. Material

The chronological frame as covered by animal remains from archaeological excavations in the Western Desert encompasses the early Holocene to the end of the Old Kingdom/First Intermediate Period (c. 9000–2000 BC). Since archaeologists developed separate chronological systems for each distribution area of a prehistoric cultural unit (see Kuper 2006), the chronological classification for the Holocene occupation of the Eastern Sahara proposed by Kuper (2006: tab. 10) will be applied to harmonise these chronologically overlapping regional systems and allow a synopsis of all finds from the study area (**Fig. 1**). Kuper's system comprises four phases, namely the "Early, Middle, Late and Final Holocene occupation of the Eastern Sahara" (Kuper 2006: 265). The absolute chronology of this system was derived from ^{14}C -dates of archaeological sites in the Western Desert (cf. Kuper & Kröpelin 2006):

- (I) Early Phase: c. 9000 – 7000 BC
- (II) Middle Phase: c. 7000 – 5300 BC
- (III) Late Phase: c. 5300 – 3500 BC
- (IV) Final Phase: from c. 3500 BC onwards

The last time slice is of special interest for the topic of the workshop since it covers the so-called Pyramid Ages, the pictorial evidence of which triggered the discussion (cf. Herb & Förster, this volume). Categorising sites according to Kuper's phasing, however, means that several sites have to be excluded since no relative or absolute dates are available. This, of course, leads to a constriction of the data pool, but a diachronic as well as a synchronic analysis is only possible with properly dated material. Therefore the original database of 32 sites yielding faunal remains had to be limited to 24 sites.

The Western Desert of modern Egypt, ranging from the Nile Valley to the Libyan border and from the Mediterranean coast to the Sudanese border, was chosen as the study area for this report (**Fig. 2**). However, this area is certainly only partially congruent with the 'Red Land' of the ancient Egyptians (cf. Hofmann 2000). Furthermore the sphere of influence of the ancient Egyptian state changed through time in size and intensity and has never been static. As shown by finds on the Abu Ballas Trail, the Egyptian influence in the Western Desert reached at least as far as the Gilf Kebir during late Old Kingdom/First Intermediate Period times (Förster 2007a; 2007b), and most recently a hieroglyphic rock

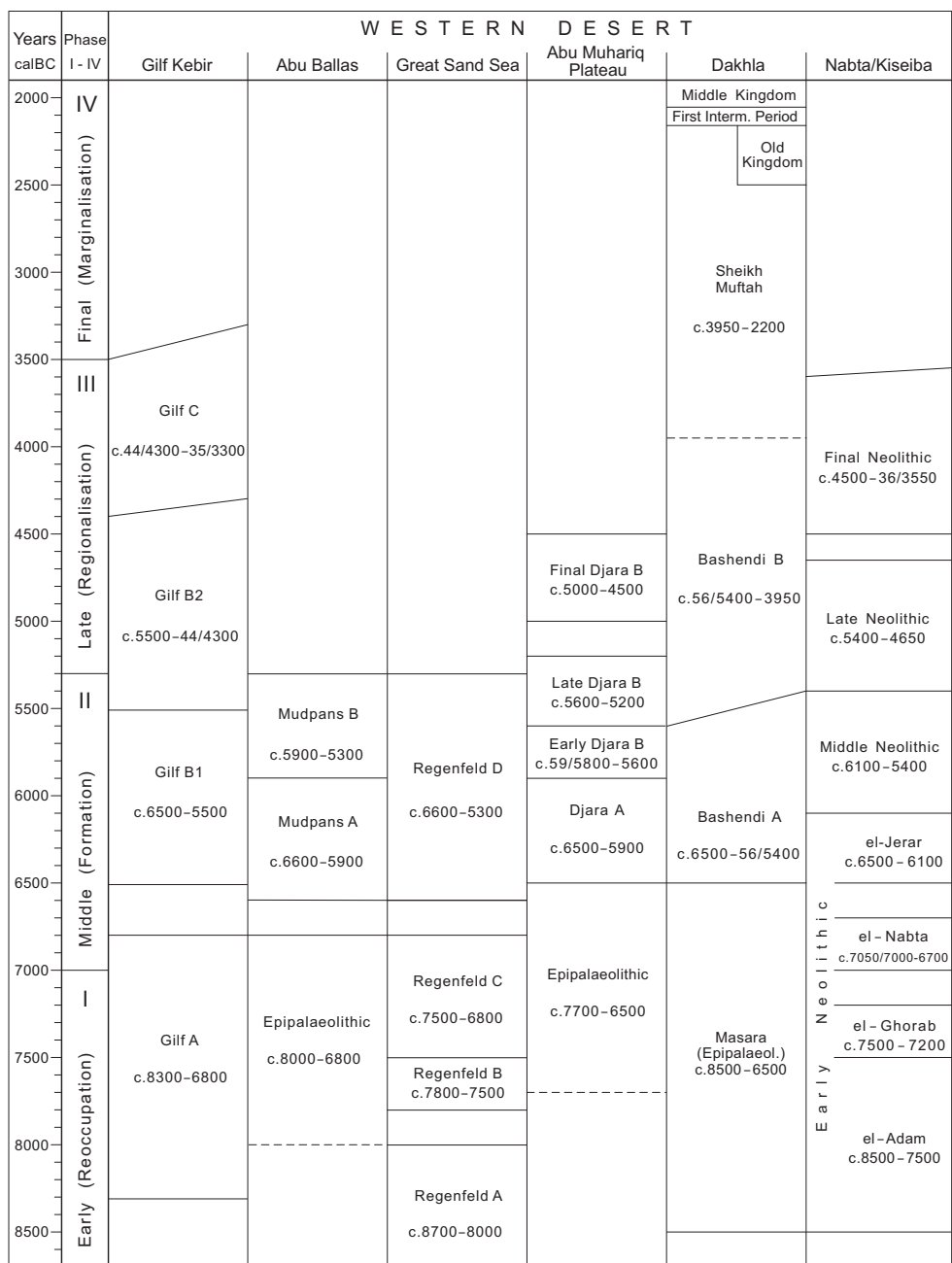


Fig. 1 Chronological chart of the Western Desert of Egypt showing the occupation phases I–IV (after Kuper 2006) and the major regional chronological sequences (ages are given in calibrated dates BC).

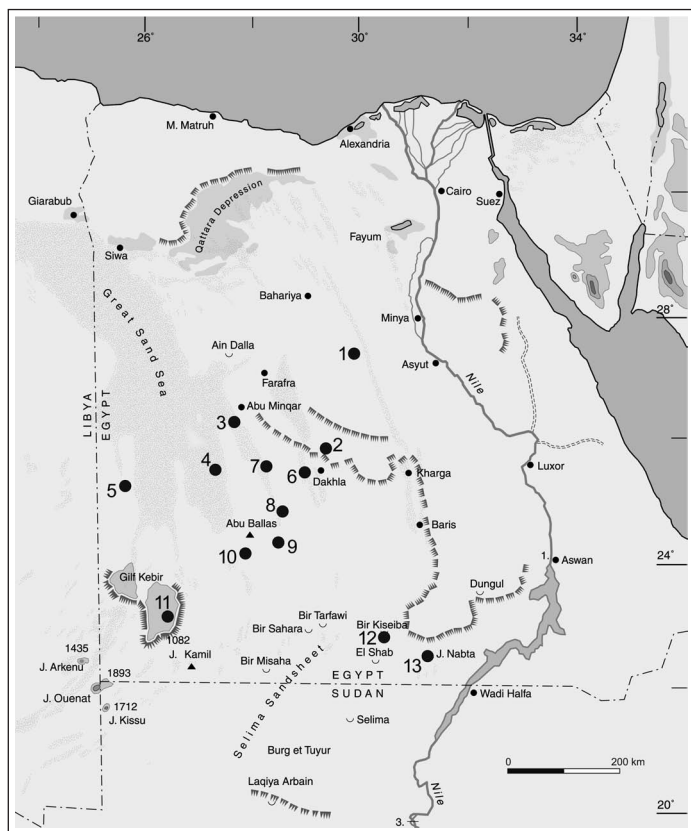


Fig. 2 Map of the study area showing the position of sites or micro-regions in the Western Desert of Egypt discussed in the text. Details of sites and faunal assemblages are listed in **Tabs. 1; 3**.

ABU MUHARIQ PLATEAU (AMP)

- 1 Djara
- 2 El Kharafish

GREAT SAND SEA (GS)

- 3 Abu Minqar
- 4 Regenfeld
- 5 Glass Area

DAKHLA OASIS (DO)

- 6 Dakhla

ABU BALLAS SCARP-LAND (AB)

- 7 Chufu
- 8 Jaqub
- 9 Mudpans
- 10 Westpans

GILF KEBIR (GK)

- 11 Wadi Bakht

NABTA/KISEIBA (NK)

- 12 Bir Kiseiba
- 13 Nabta Playa

inscription of early Middle Kingdom date has even been found at Jebel Ouenat (Clayton et al. 2008). However, the regions where the Egyptians may have hunted and caught the so-called ‘desert animals’ were most likely much closer to the Nile Valley. Therefore we can safely assume that our study area will cover at least some of the hunting grounds of the ancient Egyptians of the Nile Valley and additionally the hunting grounds of the contemporary oasis dwellers. In the following the main focus will be on finds from the desert itself.

This study area will be subdivided into the following regions for which archaeozoological evidence is attested: The Abu Muhariq Plateau (AMP), the Great Sand Sea (GS), the Abu Ballas Scarp-land (AB), the Gilf Kebir (GK), and the Nabta Playa/Bir Kiseiba region (NK) (**Fig. 2**). The bulk of sites and of materials were recovered during archaeological excavations and surveys in the first four regions listed above by the B.O.S. (“Besiedlungsgeschichte der Ost-Sahara”) and the ACACIA (“Arid Climate, Adaptation and Cultural Innovation in Africa”) projects based at the University of Cologne between

Region	Site no. on Fig. 1	Site	Typo- chronological phase	Phase after Kuper 2006	References (archaeo- zoology)
AMP	1	Djara 90/1	Djara A–B	II	Pöllath 2010
AMP	2	El Kharafish 02/5	Late Sheikh Muftah/Dyn. 4	IV	Pöllath, in prep.
GS	4	Regenfeld 96/1-1, 96/1-2-layer 3, 96/1-3, 96/1-4, 96/1-5	Regenfeld A-C	I	unpublished
GS	4	Regenfeld 96/1-2-layer 1, 96/1-C1.4, 96/19	Regenfeld D	II	unpublished
GS	3	Abu Minqar 81/55	-	II	unpublished
GS	5	Glass Area 81/61-1 und -2	-	I–II	Van Neer & Uerpmann 1989
AB	9	Mudpans 83/39	-	I	Van Neer & Uerpmann 1989
AB	7	Chufu 02/15-1	-	I	unpublished
AB	7	Chufu 02/14, 02/15-2, 02/16, 02/17-4	-	II	unpublished
AB	9	Mudpans 85/50, 85/51	Mudpans A–B	II	Van Neer & Uerpmann 1989
AB	10	Westpans 85/53-2	Mudpans A	II	Van Neer & Uerpmann 1989
AB	7	Chufu 02/17-1, 02/17-2, 02/17-3	-	III	unpublished
AB	10	Westpans 85/54-1	Gilf C	III	Van Neer & Uerpmann 1989
AB	8	Jaquib 99/31	Late Old King- dom/FIP	IV	unpublished
AB	6	Dachla 99/38-2	Late Sheikh Muftah/Dyn. 4/6	IV	Riemer et al. 2005
GK	11	Wadi Bakht 82/22	Gilf B–C	III	Fäder 2005
NK	12	Bir Kiseiba	Ghorab	I	Gautier 2001
NK	12	Bir Kiseiba	Adam	I	Gautier 2001
NK	13	Nabta Playa	Adam	I	Gautier 2001
NK	12	Bir Kiseiba	Jerar	I/II	Gautier 2001
NK	12	Bir Kiseiba	Nabta	I/II	Gautier 2001
NK	13	Nabta Playa	Jerar	I/II	Gautier 2001
NK	13	Nabta Playa	Nabta	I/II	Gautier 2001
NK	13	Nabta Playa	Middle Neolithic	II	Gautier 2001
NK	12	Bir Kiseiba	Middle Neolithic	II	Gautier 2001
NK	13	Nabta Playa	Middle/Late Neol.	II/III	Gautier 2001
NK	12	Bir Kiseiba	Late Neolithic	III	Gautier 2001
NK	13	Nabta Playa	Late Neolithic	III	Gautier 2001
NK	13	Nabta Playa	Final Neolithic	IV	Gautier 2001
NK	13	Nabta Playa	C-Group	IV	Gautier 2001
Fayum	-	Site 1 (= site R)	Fayum A	III	Brewer 1989
Nile Delta	-	Merimde-Benisalame	Merimde culture	III	von den Driesch & Boessneck 1985
J. Abyad	-	Wadi Hariq	Handessi horizon	IV	Jesse et al. 2004
W. Howar	-	Abu Tabari S 02/28	Leiterband phase	IV	Pöllath, in prep.

Tab. 1 List of sites and faunal assemblages mentioned in the text (for abbreviations in the column “Region” see Fig. 1).

1980 and 2007 (for a synopsis of the projects see Kuper & Kröpelin 2006). These faunal assemblages were analysed by W. Van Neer, H.-P. Uerpmann, H. Berke and the present author. Some of these analyses are already published (Van Neer & Uerpmann 1989; Berke 2001; Riemer et al. 2005; Riemer et al. 2008; Pöllath 2010). The complementary assemblages from the Nabta Playa/Bir Kiseiba region were analysed and published by A. Gautier (1980; 1984; 2001). **Tab. 1** summarizes the data of all sites studied here.

Archaeozoological assemblages inform about subsistence strategies, husbandry systems and the contemporary wild fauna, to name the most important topics. The presence and amount of wild animal remains is dependent on the hunting activities of the human groups that accumulated these assemblages. For thousands of years hunting was the major activity to provide human groups with protein, besides scavenging and gathering. In regions where domesticates were successfully introduced, hunting lost its importance for human nutrition to the same degree as animal husbandry gained importance. In contrast, even after the spreading of livestock rearing, hunting persisted as the major activity in regions where environmental conditions were unsuitable for husbandry. The Western Desert of Egypt is one of these regions where husbandry was only possible in some geologically favoured areas, namely oases, where underground aquifers reach the surface, and/or in regions where watering holes persisted for some time after the raining season so that pastoralists could tend their flocks there. But also in agricultural societies hunting was always practised either to protect the fields and herds or as an opportunistic way to obtain additional meat for their groups or by-products such as furs and antler. Finally, in hierarchical societies as in the medieval aristocratic states and the absolutist states in early modern times hunting was a sport and leisure activity exclusively for the higher classes. When interpreting the results, however, it has to be considered that the choice of animals taken might differ when analysing the wild animal remains of a hunter-gatherer society or of an agricultural community or of aristocratic hunts.

Further taphonomic issues are the modification of the organisms by humans and by environmental factors after their death. The first include the dismembering of the carcass, preparing of the meat, and the treatment of the leftovers. These can be considered similar in the study area and in the Nile Valley. Modifications caused by environmental factors, however, are quite different for faunal remains from the desert and from the Nile Valley. On most desert sites wind erosion of the embedding soil leads to an exposure of the bones to wind and sun. The complete drying-up of the bones causes further fragmentation into small splinters (**Fig. 3**). Soils in the Nile Valley are not as vulnerable to wind erosion and desiccation because of their dense plant covers. Finds embedded in these soils are hence protected against the destructive effects of the elements and are therefore less heavily disintegrated. For example at Merimde 66.6 % of the mammal bones could be assigned to the species, genus or family level, whereas 33.4 % were unidentifiable (von den Driesch & Boessneck 1985). On the contrary, at Djara 90/1-21, an excavation of a



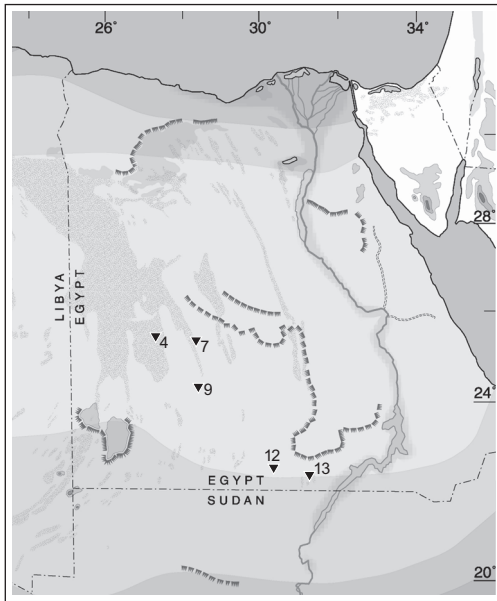
Fig. 3 Typical unit of bone material excavated at Djara 90/1-21. Splintered bones showing heavily eroded surfaces (for scale see Fig. 4).



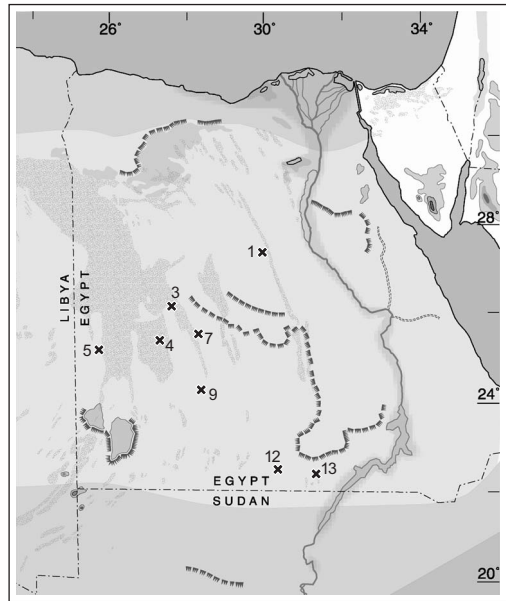
Fig. 4 Unit from El Kharafish 02/5 showing faunal remains with excellent preservation. Even the horn cover of the bill and feathers are preserved.

small habitation place around a camp fire situated on the Abu Muhariq Plateau, only c. 12.5 % of the bones were identifiable to the species, genus, or family level, leaving 87.5 % of the bones unidentified (Pöllath 2010). However, in particular conditions where the material is sealed immediately after its deposition, preservation of animal tissues is much better even on desert sites. One example is the site El Kharafish 02/5 where the material was dumped in a rock shelter and obviously covered quickly by sediment (Riemer et al. 2008). In those cases even feathers and soft tissues like sinews are preserved (**Fig. 4**) resulting in more identifications to the species level. But these are exceptions to the rule. The low degree of identification narrows the chance to reconstruct the distribution of a particular species in the past. The differential identifiability of materials from desert and Nile Valley sites also hampers the comparability of these materials.

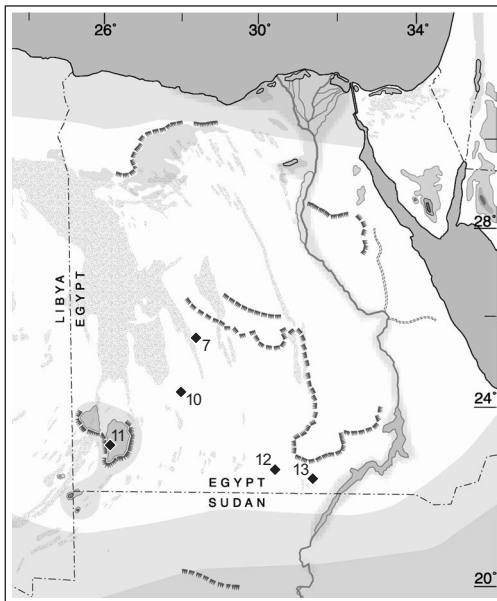
The spatial and chronological distribution of the faunal remains from the Western Desert is given in four time slices according to Kuper (2006) (**Fig. 5,I–IV**). Considering the respective map for each phase, the distribution of sites per phase is obviously not even. Whereas the areas of interest are quite evenly covered during the earlier phases, the last phase is only represented by finds in the close vicinity of the Dakhla Oasis and from Nabta Playa. The emptiness of the area between Dakhla Oasis and the Nile Valley in the last phase is especially unfortunate, since this would be the first region to look for the hunting grounds of the ancient Egyptians in the desert.



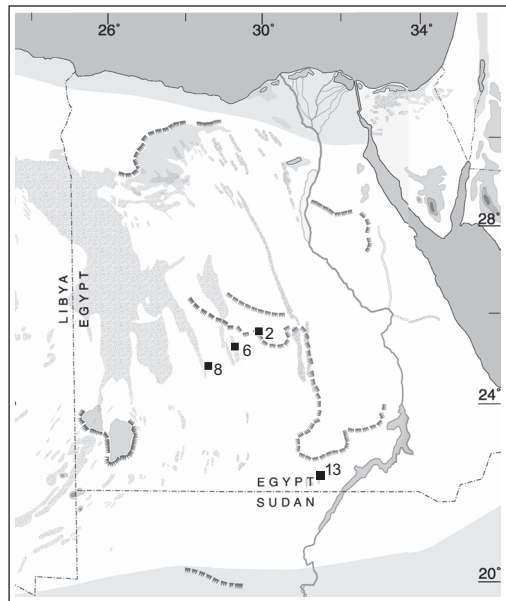
Phase I



Phase II



Phase III



Phase IV

Fig. 5 Distribution of the sites according to the occupational phases after Kuper 2006: I Early phase (c. 9000–7000 BC); II Middle phase (c. 7000–5300 BC); III Late phase (c. 5300–3500 BC); IV Final phase (c. 3500 BC onwards). For climate change and vegetation zones (shaded in grey) see Kuper & Kröpelin 2006.

In a nutshell: several biasing factors have to be considered when looking at the game bag of prehistoric hunters. The absence of a species in the archaeofauna of a certain area during a certain phase does not necessarily mean its absence in the past. It may be missing due to taphonomic processes, due to lack of archaeological finds and the limited research in general, or due to the fact that the animals were not killed and/or dismembered on site.

3. The ancient Egyptian depictions and the archaeozoological record

‘Desert animals’ is the general term in Egyptology for the non-domestic and non-aquatic animals that were depicted as game or illustrative additions in hunting scenes and as sacrificial animals hunted or caught, subsequently kept in towns and eventually presented in temple scenes (Boessneck 1988: 35–46; cf. Herb & Förster, this volume). Boessneck (1988: 36, tab. 7) listed all species that can be identified in the ancient Egyptian hunting scenes of Old to New Kingdom times; the list in Herb & Förster (this volume: tab. 1), drawing on the iconographic data of the Old and Middle Kingdoms, additionally differentiates between the pictorial contexts in which ‘desert animals’ are shown. In **Tab. 2** the occurrence of ‘desert animals’ in the tomb and temple decorations is confronted with the archaeozoological evidence from desert sites. In the list of the archaeozoological record, data from all assemblages available was compiled to present the most comprehensive database possible. Therefore sites with mixed materials from different periods or of unknown date were included as well as sites with few specimens identified and single stray finds (for localisation, dating, and references cf. **Tab. 1**).

The concordance of both, pictorial evidence and archaeozoological data, is quite high. Species definitely missing from the desert record of archaeofauna are: hartebeest, aurochs, Mesopotamian fallow deer, wild ass, Nubian ibex, and Arabian oryx. The absence of the first four species in this group can easily be explained by their requirements regarding water, food, and habitat. The preferred biotopes of hartebeest and African aurochs are the wetlands and savanna-like grasslands with light woods. In Egypt these habitats are restricted to the oases and the Nile Valley, where these animals are identified in the archaeozoological record (cf. Linseele & Van Neer, this volume). The Mesopotamian fallow deer most probably has never been part of the native mammalian fauna of Egypt (Kitagawa 2008). The last wild populations of the (Nubian) wild ass, meanwhile also extinct, lived in the Red Sea hills east of the Nile, but a subspecies of the African wild ass is said to have roamed the hilly country along the Egyptian-Sudanese border (Osborn & Helmy 1980; Clutton-Brock 1987: 92). Its absence from the archaeozoological record is most likely accidental, since Bir Tarfawi and Bir Sahara, two sites dating to the Middle Palaeolithic, yielded remains of wild ass (Gautier 1993; Marshall 2007: fig. 20.2). It possibly was not very abundant in the catchment areas of the sites presented here. Finally, the remaining species, the Nubian ibex and the Arabian oryx, com-

	Pictorial record			Bone record Sites in the Western Desert of Egypt
	Wild animals depicted	Wild animals kept in towns	Wild animals slaughtered	
<i>Bos primigenius</i>	x	-	-	-
<i>Alcelaphus buselaphus</i>	x	x	-	-
<i>Addax nasomaculatus</i>	x	x	-	x
<i>Oryx dammah</i>	x	x	x	x
<i>Oryx leucoryx</i>	x	-	-	-
<i>Nanger (Gazella) dama</i>	(?)	(?)	(?)	x
Small gazelles (<i>Gazella leptoceros</i> , <i>G. dorcas</i>)	x	x	x	x
<i>Capra nubiana</i>	x	x	x	-
<i>Ammotragus lervia</i>	x	x	-	x
<i>Dama mesopotamica</i>	x	x	-	-
<i>Giraffa camelopardalis</i>	x	-	-	x
<i>Equus africanus</i>	x	-	-	-
<i>Lepus capensis</i>	x	-	-	x
<i>Herpestes ichneumon</i>	x	-	-	(x)
<i>Hyaena hyaena</i>	x	x	-	(x)
<i>Canis aureus</i>	x	-	-	x
Foxes (<i>Vulpes vulpes</i> , <i>V. rueppellii</i> , <i>V. zerda</i>)	x	-	-	x
<i>Parechinus aethiopicus</i>	x	-	-	(x)
<i>Struthio camelus</i>	x	-	-	(x)

(x) = Species identified on sites not listed in **Tab. 3**.

(?) = Identification uncertain

Tab. 2 Wild animals attested on ancient Egyptian depictions (cf. also Herb & Förster, this volume: tab. 1) and in the archaeozoological record from the desert.

prise species whose habitats lay outside the study area: The main distribution area of the Arabian oryx lies on the Arabian Peninsula, possibly extended to the Sinai and the Eastern Desert of Egypt (Manlius 2000). The Nubian ibex lives in the mountainous regions of the Eastern Desert of Egypt (Haltenorth & Diller 1977).

A group of animals depicted in ancient Egyptian scenes is proven in archaeozoological assemblages in general, but not from sites contemporaneous to these depictions. Those are the hyena, the ostrich, the desert hedgehog and the Egyptian mongoose. These animals are always rare in archaeological material since they have never been preferred game for either regular or occasional hunters. Therefore, their bones are rare finds in general and even rarer in assemblages under the bad conditions for preservation in the desert. Considering the limited material from desert sites of the youngest occupation phase (IV), their rareness in general and their absence from the assemblages contemporaneous to the dynastic depictions is not surprising.

The high concordance of the pictorial and the osseous record confirms that the ancient Egyptian artists and their clients had a thorough knowledge of the desert fauna around them. The composition of species native to the Eastern and those native to the Western Desert together with species that the Egyptian artists certainly had not seen in the wild, such as the Mesopotamian fallow deer, shows that the mural depictions reflected an ideal: that of the wild animals controlled and exploited by man.

4. The archaeofaunas

Following this brief confrontation of the ancient Egyptian depictions and the archaeozoological record, the archaeofaunas from desert sites will be presented and discussed chronologically. For this, only well-dated sites with identifications to the species level were chosen (**Tab. 3**). Small mammals such as rodents as well as reptiles and birds were excluded from the list, except for the ostrich, *Struthio camelus*, since it also had been counted among the ‘desert animals’ (Boessneck 1988: 36, tab. 7). Domestic animals will only be discussed as far as their presence affects the evidence of the desert animals. Sites dating to two phases will be listed together with the sites of the earlier phase. The last phase (IV) will be discussed more intensively since it covers the time periods during which the ancient Egyptian depictions of desert animals have been made.

4.1. Early Phase (I), c. 9000–7000 BC

Kuper (2006: 267) characterises the Early Phase as a time of “reoccupation” of the Western Desert following the onset of rainfalls (the beginning of the Holocene humid phase) after the hyper-arid Pleistocene. According to its material culture this phase can be referred to as Epipalaeolithic. The people(s) that roamed the Western Desert were mainly hunter-gatherers that did not produce pottery. The animals most frequently exploited by them were small gazelles (the dorcas, *Gazella dorcas*, and the slender-horned gazelle, *G. leptoceros*), followed by the dama gazelle, *Nanger dama*, the Cape hare, *Lepus capensis*, and the scimitar-horned oryx, *Oryx dammah* (**Tab. 3**). Addax, *Addax nasomaculatus*, ostrich, *Struthio camelus*, Barbary sheep, *Ammotragus lervia*, and carnivores such as common jackal, *Canis aureus*, wild cat, *Felis silvestris*, and striped hyena, *Hyaena hyaena*, were of minor importance. Both small gazelle species, *Gazella dorcas* and *G. leptoceros*, are quite similar in size, and their postcranial bones do not differ morphologically. The only skeletal element that allows differentiation are the horn cores, in particular their shape and size. Since those are rarely preserved, the differentiation of both species was impossible and all these bones were lumped into the category ‘small gazelles’. However, judging from the present situation the dorcas also should have been predominant in the early

Fig. 1

Phase after Kuper 2006

Region	Site no. on Fig. 1	Site	Small gazelles (<i>Gazella dorcas</i> , <i>G. leptoceros</i>)	Nanger (<i>Gazella</i>) <i>dama</i>	<i>Oryx dammah</i>	<i>Addax nasomaculatus</i>	<i>Ammotragus lervia</i>	<i>Lepus capensis</i>	<i>Hyæna hyæna</i>	<i>Canis aureus</i>	<i>Felis silvestris</i>	<i>Caracal caracal</i>	<i>Vulpes rueppellii</i>	<i>Vulpes zerda</i>	canid unidentified	<i>Struthio camelus</i> (bones)	Sum wild animals	Cattle	Small livestock	Donkey
GS	4	Regenfeld 96/1-1, 96/1-2-layer 3, 96/1-3, 96/1-4, 96/1-5	61	1	-	5	-	5	-	-	-	-	-	(x)	-	-	72	-	-	-
AB	7	Chufu 02/15-1	95	-	-	-	-	9	-	-	-	-	-	-	-	-	104	-	-	-
AB	9	Mudpans 83/39	13	-	-	-	-	1	-	-	-	-	-	-	-	-	14	-	-	-
NK	12	Bir Kiseiba (Adam Neolithic sites)	445	66	-	-	-	26	-	8	2	-	-	-	-	-	547	16	-	-
NK	13	Nabta (Adam Neolithic sites)	98	18	-	-	-	7	-	-	-	-	-	-	-	-	123	6	-	-
NK	12	Bir Kiseiba (Jerar/Chorab Neol. sites)	320	20	-	-	-	-	3	8	15	-	-	-	-	-	575	3	-	-
NK	13	Nabta (Jerar/Nabta Neolithic sites)	979	55	-	-	1	744	7	10	2	-	-	-	3	3	1801	29	13?	-
GS	5	Glass Area 81/61-1, 81/61-2	9	21	65	-	-	1	-	-	-	-	-	-	-	-	96	(3) ¹	-	-
AMP	1	Djara 90/1	56	7	13	12	2	-	-	-	-	1	-	-	1	1	93	-	2	-
GS	4	Regenfeld 96/1-2-layer 1, 96/1-Cl. 4, 96/19	8	-	-	-	-	3	-	-	-	-	-	1	-	1	12	-	-	-
AB	7	Chufu 02/14, 02/15-2, 02/16, 02/17-4	15	6	-	-	-	6	-	1	-	-	-	-	-	-	28	-	-	-
AB	9	Mudpans 85/50, 85/51, 85/56	1056	458	896	-	-	109	1	18	-	-	10	5	1	75	2554	-	-	-
NK	12	Bir Kiseiba (Middle Neolithic sites)	64	2	-	-	-	51	-	2	-	-	1	-	2	-	122	3	-	-
NK	13	Nabta (Middle Neolithic sites)	222	43	-	-	4	245	-	29	6	-	-	-	-	-	549	32	120	-
NK	13	Nabta (Middle/Late Neolithic sites)	63	10	2	1	35	1	-	1	-	-	-	-	-	-	112	13	42	-
AB	7	Chufu 02/17-1, 02/17-2, 02/17-3	5	1	1	-	-	-	-	-	-	-	-	-	-	4	7	-	-	-
AB	10	Westpans 85/54-1	26	-	-	-	-	-	-	-	-	-	-	-	-	-	26	-	-	-
GK	11	Wadi Bakht 82/22	9	1	-	-	-	-	-	-	-	-	-	-	-	-	10	5	(1) ²	-
NK	12	Bir Kiseiba (Late Neolithic sites)	16	2	-	-	-	3	-	-	-	-	-	-	-	-	21	3	-	-
NK	13	Nabta (Late Neolithic sites)	202	245	1	2	176	-	13	-	-	1	-	-	-	-	640	90	202	-
NK	13	Nabta (Final Neolithic/C-Group sites)	8	3	-	-	1	5	-	-	-	-	-	-	-	-	17	10	26	-
AMP	2	ElKharafish 02/5	133	-	-	1	-	3	-	-	-	-	8	5	17	-	167	1	(x) ³	-
AB	6	Dachla 99/38-2	65	-	1	-	-	1	-	-	-	3	1	22	-	-	93	5	2	1
AB	8	Jaquib 99/31	8	2	4	-	-	-	-	-	-	-	-	-	-	-	14	-	1	1

¹ Three bones of sheep were collected in 2000 from a phase II area of the site. The small 2000 collection is excluded from this report. ² Probably from a later occupation. ³ Dung of small livestock.

Tab. 3 The game spectrum on sites in the Western Desert of Egypt given in numbers of identified specimens (for references see **Tab. 1**; for abbreviations in the column "Region" see **Fig. 1**).

Holocene (Osborn & Helmy 1980). At most sites small gazelles are the most numerous game by far. Only at Glass Area 81/61 the scimitar-horned oryx ranks first followed by the dama gazelle. The latter is also the second most species at Nabta Playa and Bir Kiseiba, whereas hares take this position at the remaining sites.

Both species of the small gazelle category and the dama gazelle are typical animals of the desert and semi-desert, which would still find ideal living conditions in this region if anthropogenic interferences had not caused the disappearance of the dama gazelle from the region (Newby et al. 2008). Today, the dorcas can be observed regularly whereas the slender-horned gazelle is a rare sighting (Osborn & Helmy 1980: 487–513; cf. Berke, this volume). All three of them can go without water for long periods, the dama gazelle even for all of its life, only depending on the moisture content of food plants (Happold 1987). The addax is said to be the antelope best adapted to desert conditions and most tolerant to high temperatures and extreme aridity (Newby & Wachter 2008). It is a gregarious species that roams the desert in small groups. Nonetheless, the addax is almost absent from the faunal record: only the assemblage from Regenfeld 96/1 yielded a few bones. As a middle-sized antelope the addax certainly was an adequate game species. Its gregarious habit speaks also in favour of it. Thus its rareness in the faunal record is surprising. The scimitar-horned oryx is also present only in one assemblage in the Early Phase, although quite numerous there (Glass Area 81/61). Its chronological position, however, is not entirely clear, and they may also belong to phase II. The oryx is also quite well adapted to arid conditions although its requirements are clearly higher than those of the gazelles and the addax. After sufficient rainfalls it migrates from the semi-arid thornbush savanna belt to the north into the desert (Dorst & Dandelot 1972: 201).

The hare is an almost ubiquitous animal, which may occupy sufficiently vegetated spots even in hyper-arid parts of the desert. It is very adaptable and, like the gazelle species mentioned above, may satisfy its water requirements by the moisture content of its food plants. Consequently, hare seems to have been widespread in the study area during this period and still is, even though it seems to be elusive nowadays (Osborn & Helmy 1980: 90–93; 85 fig. 30).

Concerning numbers of species, carnivores form the second largest group of animals after bovids. In terms of bone counts, however, carnivores are of minor importance standing back behind the hare. It can be doubted whether hyena, wild cat, and jackal were hunted for their meat. Although their meat may also have been eaten, their furs were maybe more desired. Remarkably, bones of carnivores are only present at the Nabta Playa/Bir Kiseiba sites.

Finally, few bones of ostrich and a single bone of Barbary sheep have to be mentioned. As an inhabitant of mountainous regions the preferred habitats of the Barbary sheep lie to the south-western corner of the region considered, namely the Gilf Kebir and the Jebel Ouenat. Its rareness is therefore not surprising. Outside the mountain ranges, Barbary sheep populations obviously inhabited only few isolated areas such as the Nabta

Playa/Bir Kiseiba region during early Holocene times (Gautier 2001), and probably the region around the oases of Kharga and Dakhla during later phases (Pantalacci & Lesur-Gebremariam, this volume; Hendrickx et al., this volume).

The ostrich on the other hand could have been relatively frequent in some parts of the region since it is more or less independent from surface water and can therefore also inhabit arid environments as long as there is enough vegetation to meet its moisture and food requirements. The infrequency of ostrich bones in faunal assemblages, however, is under debate (Gautier 1984; 2001: 615; Pöllath 2010). Food taboos are considered a possible reason (Gautier 1984). The most famous taboo laid on ostrich meat consumption is known from the Bible (Leviticus 11:16). Taphonomic factors might also play an important role in this, since bird bones are rarely preserved on desert sites in general. Finally, ostrich bones are considered accidental pene-contemporaneous intrusives, which seems to be a rather unlikely explanation for all Holocene finds in the Western Desert. Though rare, their presence in the record proves the occurrence of ostriches in the region and that the Epipalaeolithic inhabitants of the region consumed their meat at least occasionally.

Already in this phase first bones of domestic animals seem to appear at sites of Nabta Playa and Bir Kiseiba (Gautier 2001). The discussion on the status of these finds as domestic or wild cattle as well as the dating of these bones is still going on (Hassan 2000; Wendorf & Schild 2005) and the reasons and triggers as well as the process itself are not completely understood until now. If domestic cattle were present at Nabta Playa as early as the 9th millennium BC (Gautier 2001; Gautier 2007), it does not affect this study since it seems to have been a phenomenon limited to this specific area and of little effect on subsistence strategies since hunting obviously prevailed even in the Nabta Playa area according to the ratio cattle:game (**Tab. 3**).

4.2. Middle Phase (II), c. 7000–5300 BC

The Middle Phase of the Holocene occupation in the Western Desert is defined by Kuper (2006: 267) as the “formation” period. During this phase human activities were most intensive in the region due to the proposed maximal humid conditions. In the course of the second half of the 7th millennium BC several cultural innovations occurred: pottery became part of the material culture; stone technology changed; small livestock was introduced and keeping of large and small livestock was spread. The latter certainly marks the most important development since it denotes a fundamental change in subsistence strategies and hence a completely new way of living. The probable domestication of the African aurochs has already been mentioned in the previous paragraph. According to bone finds this phenomenon seems to have been limited to the Nabta Playa/Bir Kiseiba region during the Early Phase. Evidence for cattle keeping in other parts of Egypt date to the late 7th/early 6th millennium BC and come from the Dakhla Oasis and from the Gifl Kebir (cf.

the compilation of data in Riemer 2007: tab. 1). Approximately at the same time sheep and goat appear in the study region (Djara, Hidden Valley/Farafra Oasis, Dakhla Oasis, Kharga Oasis, Nabta Playa/Bir Kiseiba region; cf. Riemer 2007: 108–109, tab. 1). Interestingly, the finds from Djara 90/1 situated on the Abu Muhariq Plateau and the Nabta Playa/Bir Kiseiba region are the only proofs of small livestock outside the oases and relatively far from the Nile Valley (**Fig. 2**) (Pöllath 2010; Gautier 2001; 2007). Earliest known evidence for sheep and goat in the Nile Valley comes from Merimde and is decidedly younger, dating to the 5th millennium BC (von den Driesch & Boessneck 1985). Where animal husbandry was possible, livestock apparently replaced wild game relatively quickly as a source of animal protein (Riemer 2007; Pöllath 2010). In most parts of the study area, however, hunting continued to be the mainstay of human groups as can be seen from the almost complete absence of bones from livestock. Single bones of cattle or small livestock occasionally found in mid-Holocene assemblages, e.g. Djara 90/1 and Glass Area 81/61, can probably be interpreted as tentative (and possibly not very successful) attempts to introduce livestock to this region. Only the Nabta Playa/Bir Kiseiba region sites seem to be exceptions.

During the Middle phase hunters aimed at the same game species as their predecessors in the previous occupation phase (**Tab. 3**). Small gazelles are still the most important game, followed by hare, dama gazelle, and scimitar-horned oryx in changing orders. Compared to the first phase, the oryx seems to gain more relevance. Remains of carnivores exhibit a slightly different pattern: they principally were rare during phase I and only attested for the Nabta Playa/Bir Kiseiba region. Besides this region, the assemblages from Djara, Regenfeld, Chufu, and Mudpans also yielded some bones of carnivores during the second phase. Osseous remains of ostriches are rare but nevertheless present in two faunal assemblages.

4.3. Late Phase (III), c. 5300–3500 BC

For the third phase few sites with only small amounts of identified bones are known up to now. This is surely caused by the deteriorating climatic conditions (Kuper 2006: 268). The increasing aridity led to a regionalisation of the desert occupation. Prehistoric settlers began to withdraw from the land, which became increasingly hostile to man. Retreat areas were the oases and the Nile Valley, where settlements were either intensified or established for the first time as in the case of the Nile Valley. Regions offering more favourable conditions such as the Gilf Kebir and the southern plains around Nabta Playa and Bir Kiseiba served as retreat areas for livestock keeping groups as proven by osseous evidence (**Tab. 3**). The remaining sites of the study area, however, only yielded bones of wild animals and are proof of the fact that the land between the retreat areas was still roamed by pure hunter-gatherer communities despite the deteriorating conditions. Judging from the low number of finds, population densities, however, seem to have decreased considerably.

Concerning wild animals, the faunal composition of all Late Phase assemblages shows almost no differences in comparison to that of the previous periods. Small gazelles are still the most hunted game, followed by hare and dama gazelle. Oryx seems to have lost importance, as did carnivores. But that could also be a statistical problem due to the small sample sizes with only the Nabta Playa assemblage yielding a considerable amount of finds.

4.4. Final Phase (IV), c. 3500 BC onwards

The final phase is characterised by the marginalisation of the eastern Sahara (Kuper 2006: 268). With only four sites up to now, the Western Desert of Egypt outside the oases seems to be almost void of human occupation. At first glance the faunal materials of these four sites do not differ much from those of the previous phases (**Tab. 3**). Remains of small gazelles still outnumber the other taxa. Dama gazelle, oryx, hare, and carnivores complete the spectrum with decidedly lower numbers. Besides, bones of domestic animals are present on all of these sites. However, if we consider that livestock formed the basis of the food economy of human groups in the Nile Valley and in the oases (see Linseele & Van Neer, this volume), the proportion of livestock seems to be extremely low.

The assemblages from the Nabta Playa area are the only ones with more bones of livestock than of wild animals. This is in stark contrast to the Nabta Playa/Bir Kiseiba sites of the previous occupation phases, where bones of livestock added considerably to the assemblage, but did not outnumber those of wild animals. Their contribution to the diet, however, is difficult to assess since milk (and blood) of livestock may have played a major role in human diet and their contribution is impossible to estimate. The scarcity of finds in this phase in comparison to the amount of identified bones in the earlier phases, however, indicates that the occupation density was much lower than in previous times. This was most likely a result of the climatic deterioration that reached this area some time later as the northern parts of the eastern Sahara. The archaeological finds and the faunal remains seem to originate from true pastoralists that frequented the desert to pasture their flocks, but went also hunting for additional animal protein supply (Gautier 2001: 631ff.).

At El Kharafish 02/5, a desert camp above the plateau escarpment c. 25 km to the north of the Dakhla Oasis, a single cattle bone proves that cattle were brought to the site. Besides this bone, dung excavated at the site is indirect evidence for the presence of small livestock (Riemer et al. 2008). This and the material culture (especially Sheikh Muftah ceramics) suggest that the seasonal visitors of El Kharafish were Sheikh Muftah people from the oasis, where they lived on livestock keeping, hunting, and gathering of wild cereals (McDonald 2002).

Tab. 3 lists only the mammal remains found at El Kharafish; but bones of migratory and resident birds as well as eggshells of resident bird species formed an important part of the faunal remains suggesting that fowling and egg collecting was also practised to provide

man with food. Bones of small gazelles, the most frequent mammals at this site, show an interesting age profile: Bones of fetal, neonate and infantile animals are amazingly numerous. This and the presence of migratory bird species lead to the conclusion that El Kharafish 02/5 was most likely visited during springtime (Riemer et al. 2008: 601). If we look at the mammal species' composition of this site, the considerable number of bones from foxes attracts attention. They rank second after the small gazelles, whereas hare and addax contribute only little. The reason why these people left the oasis for some time and stayed at a desert camp is still not completely understood. Nevertheless the results from the analysis of the animal remains at El Kharafish tell us two things: (1) Oasis dwellers went to the desert nearby the oasis with (some) livestock; and (2) hunting and fowling was an important activity for them when on the site. The (small) livestock that was present according to the dung found at the site was not slaughtered there as indicated by the absence of their bones. Since it was cumbersome and exhausting to make the trip up the limestone escarpment, livestock must have served another purpose, which was most likely to provide humans with their milk.

A similar situation can be found at site Dachla 99/38 about 20 km south-west of Dakhla Oasis: Small gazelles are the most hunted game followed by carnivores (caracal and foxes). Again the presence of livestock is attested only by few finds. The inhabitants of this site apparently had to hunt in order to secure their animal protein supply, whereas meat of livestock contributed only little to their diet. The site is situated at small hills. According to the archaeological finds it dates to the 4th dynasty and to the end of the Old Kingdom (mid and late 3rd millennium, respectively; Riemer et al. 2005). The pottery found at the site indicates the presence of Egyptians (at least for the end of the Old Kingdom) as well as the presence of Sheikh Muftah people from the Dakhla Oasis (probably during the 4th dynasty). According to the analyses of the material culture, the rock engravings and the architectural features, this site can probably be regarded as a so-called hilltop site put up to control the fringes of the oasis (Riemer et al. 2005). The main activity of its inhabitants was not to hunt or herd animals but to control the pathways from and to the oasis (cf. Kaper & Willems 2002). Food provision possibly consisted of storable seeds, such as cereals and legumes, and dried meat; but fresh meat was certainly a highly desired change on the menu.

The fourth site in this phase, Jaqub 99/31, is characterised by a large Egyptian pottery assemblage consisting of water jars, drinking bowls and vats for bread preparation (Kuper et al. 2003; Schönfeld 2007; Förster 2007b) and is therefore interpreted as a resting and supply station on the Abu Ballas Trail during the late Old Kingdom or early First Intermediate Period (c. 2200/2100 BC). The Abu Ballas Trail was an Egyptian trans-Saharan route leading about 400 km from Dakhla Oasis to the Gilf Kebir Plateau and probably farther into sub-Saharan Africa (Förster 2007a; 2007b). Jaqub 99/31 is located in the first third of the trail's section between Dakhla and the Gilf Kebir, about 100 km south-west of Dakhla Oasis. The small bone assemblage suggests that hunting wild bovids (small

gazelles, dama gazelle, and oryx) covered some, maybe even the bigger part of the meat demand of Egyptian watchmen stationed for some time at the site (**Tab. 3**). This seems also logical if we consider that the drinking water for humans and animals, the most important matter when travelling through the desert, had to be carried along on donkey backs. Every additional animal brought along would have meant additional water jars or smaller shares for humans and donkeys. Hunted animals therefore meant additional meat without additional consumption of water. Dried meat, which the travellers and watchmen had probably in their provisions, was maybe soon depleted and fresh meat was certainly much desired.

As a conclusion it can be stated that hunting continued to be practised during phase IV where livestock keeping was impossible or too risky due to insufficient water supply in far-out desert places (Jaqub 99/31, Dachla 99/38). In cases where conditions were suitable for livestock at least during certain periods of the year, meat of game supplemented the diet (Nabta Playa, El Kharafish 02/5).

5. Species composition and hunting techniques

Taking a diachronic look at the faunal remains from the Western Desert of Egypt, only minor changes can be observed from the first to the third phase concerning preferences of game species (**Tab. 3**). With few exceptions bones of small gazelles dominate. Hare, dama gazelle and oryx rank second in turns. Bones of hare and dama gazelle are present at most sites with hare being definitely more abundant in many assemblages. Bones of oryx are less regularly found, although they sometimes appear in large quantities especially in the second phase. The rareness of oryx in or even its complete absence from many assemblages may be connected with the fact that this species has probably never been a permanent inhabitant of the true desert but an occasional visitor coming from its fringes in years with sufficient rainfalls when pasture was aplenty for this rather demanding species. Additionally the reason for their relative infrequency in the fourth phase may originate in the fact that hunting was an opportunistic activity rather than the main activity of the people frequenting the desert at that time. On the other hand, the second antelope species to be found in the desert, the addax, is a typical inhabitant of the true desert and does also occur in larger groups, which would promise maximum hunting success. Nevertheless, addax is extremely rare in all four phases. Though regularly identified in the osseous remains, the dama gazelle, the larger gazelle species native to this arid country, is also clearly less frequent compared to the small gazelles.

For assemblages with a high ratio of small game it has been considered that animals of small size were exploited if large game was not available (any longer) (Stiner et al. 2000). This seems not to hold true for the material discussed here, since addax and dama gazelle (in moist years also oryx) certainly were more abundant than the osseous record

might suggest. In fact the faunal composition seems to be influenced by the hunting techniques of the prehistoric hunters rather than by the overall abundance of a species in the region. The small gazelles and the hare are comparatively territorial as opposed to dama, addax and oryx, which are pronouncedly migratory species (Haltenorth & Diller 1977). Both dorcas and hare visit regularly their preferred food plants, e.g. grasses, acacias or perennial shrubs, so that their habits are easily investigated. Hence these animals are captured without much effort setting up traps beneath their food plants, shooting them from behind a blind or even stalking them. Hunting the large game of the desert is less predictable since these mammals do not follow definite migration routes. But if herds of oryx or addax will cross the route of the desert hunters, hunting success will be exceeding. Sites with high ratios of oryx might be the result of such events. Long stone alignments were found in the Great Sand Sea and tentatively interpreted as game drives (Riemer 2004), which might be connected with such organised hunts on multitudinous herds of larger game, such as oryx. The long stone walls also may show that this kind of hunting technique involved more work of several people than trapping hares and small gazelles. The suggested date for some of these structures overlaps with the phases II and III, which goes well with the sites that yielded larger amounts of oryx bones. However, it has to be mentioned that the more recent discussion on the stone structures seems to indicate that the stone walls were used to trap individual animals by means of unattended foot snares rather than to drive herds into an ambush (Riemer, this volume).

Anthropogenic influences on the distribution of desert fauna cannot be traced with the material available. All species present in the faunal remains from desert sites still roamed the Western Desert in historic times (Osborn & Helmy 1980). Human population densities in the desert during the first three phases were certainly not high enough to seriously affect the gazelle and antelope populations. In general it can be assumed that traditional hunting methods are less threatening compared to habitat destruction or expulsion from preferred habitats by human settlements (cf. Linseele & Van Neer, this volume). For the fourth phase the database is too weak to draw conclusions on the anthropogenic impact on the desert fauna (cf., however, Pantalacci & Lesur-Gebremer, this volume).

6. The role of hunting for the prehistoric desert dwellers

At first glance the role of hunting as part of the subsistence strategy did not change significantly (**Tab. 3**). As said above, small gazelles and larger bovids formed the basis of animal protein supply from the first to the last phase. However, two shifts can be observed:

- (1) the introduction of livestock; and
- (2) the relatively high frequency of bones of carnivores in assemblages of phase IV.

Region	Site no. on Fig. 1	Site	Phase after Kuper 2006	bones total	domestic %	carnivores %	game %	composition type
AB	7	Chufu 02/15-1	I	104	-	-	100.0	1
GS	5	Glass Area 81/61-1, 81/61-2	I-II	96	(3) ¹	-	100.0	1
AB	8	Mudpans 85/50-1	II	235	-	-	100.0	1
AB	8	Mudpans 85/56	II	1579	-	1.5	98.5	1
NK	13	Nabta Playa	I	130	4.6	-	95.4	2
NK	12	Bir Kiseiba	I	423	3.8	2.1	94.1	2
NK	12	Bir Kiseiba	I/II	458	0.2	4.8	95.0	2
NK	13	Nabta Playa	I/II	894	0.3	0.8	98.9	2
NK	12	Bir Kiseiba	II	129	2.3	4.7	93.0	2
NK	13	Nabta Playa	II	722	21.6	4.8	73.5	2
NK	13	Nabta Playa	III	932	29.9	1.5	68.6	2
Fayum	-	Site 1 (= site R)	III	230	87.0	-	13.0	3
Nile Delta	-	Merimde-Benisalame	III	17344	96.4	0.7	2.9	3
W. Howar	-	Abu Tabari 02/28	IV	356	98.0	0.3	1.7	3
J. Abyad	-	Wadi Hariq 01/1	IV	484	96.3	-	3.7	3
AMP	2	El Kharafish 02/5	IV	167	0.6	18.0	82.0	4
AB	6	Dachla 99/38-2	IV	101	7.9	25.7	66.3	4

¹ Three bones of sheep were collected in 2000 from a phase II area of the site. The small 2000 collection is excluded from this report.

Composition types:

- 1 No evidence for domestic animals.
- 2 More than 50 % bones of wild mammals, up to 30 % bones of domestic animals, and no or only very low percentage of bones of carnivores.
- 3 More than 80 % bones of domestic animals, no or few bones of carnivores, small portion of bones from game.
- 4 Preponderance of bones from game, small portion of bones from livestock, and large number of bones from carnivores.

Tab. 4 Composition of the faunal material regarding domestic animals, carnivores, and other game (bovids, hare, ostrich) (for abbreviations in the column "Region" see Fig. 1).

The first definitely stands for a general change in subsistence strategies. The second, however, seems to indicate a minor shift from hunting as an activity to provide food to hunting as an activity to provide additional benefits.

In order to evaluate this tentative observation the relative portions of livestock, game, and carnivores in bone assemblages with statistically relevant numbers of identified specimens were calculated. In the category 'game' bones of all wild animals were combined that were targeted for human consumption, such as gazelles, larger bovids, hare

and ostrich. The dataset from the Western Desert of Egypt was enlarged by assemblages from sites in the oases, the Nile Valley and sites from the southern fringe of the eastern Sahara in the Sudan (for references see **Tab. 1**). Subsequently, the assemblages were grouped into four composition types according to their ratios domestic:carnivores:game. The results are listed according to the respective composition type of each site in **Tab. 4**. Composition type 1 comprises sites without any evidence for domestic animals. Sites with more than 50 % bones of wild mammals, up to 30 % bones of domestic animals and no or only a very low percentage of bones of carnivores were grouped in composition type 2. Assemblages dominated by bones of livestock (80 % and more), with no or few bones of carnivores and a small portion of bones from game were attributed to composition type 3. Finally, sites with a preponderance of bones from game and small portion of bones from livestock but a relatively large number of bones from carnivores constitute composition type 4.

The chronological and spatial distribution of the sites within a composition type shows further similarities besides their composition. Type 1 encompasses sites from the first two phases, which are situated far from the oases or the Nile Valley. The composition of the finds implies that hunting was the core activity to provide meat for the group. Highly mobile hunter-gatherers occupied these sites episodically (Gehlen et al. 2002; Riemer 2000; 2003).

Type 2-sites belong to phases I to III and are solely situated in the Nabta Playa/Bir Kiseiba region in relative proximity to the Nile Valley. Livestock keeping was obviously practised, although its importance cannot be read from the bone assemblages. Since these sites were occupied only temporarily, only few animals may have been slaughtered at the site, if meat of game could be obtained without much effort. At the moment it is impossible to assess the contribution of milk and blood of livestock to human diet. Therefore the subsistence strategies of these people are difficult to ascertain. They certainly practised both, hunting and herding, probably with seasonally changing intensities. At present, the best term for them seems to be *pastro-foragers* (Riemer 2007).

Composition type 3 comprises sites dating to phases III and IV. These sites are situated in the Nile Valley, in the Fayum Oasis, and in the Sudanese part of the eastern Sahara. The latter region was still part of the semi-desert or dry savanna belt at that time and therefore favoured in comparison to the already desiccated Egyptian part of the eastern Sahara. Both sites from the Sudanese part of the eastern Sahara date to phase IV. The site Wadi Hariq S 01/1 was a seasonal camp of transhumant or nomadic pastoralists. Their herds were composed of cattle and small livestock, which they herded in the Wadi Hariq after the rains (Jesse et al. 2004). Abu Tabari 02/28, located in the Lower Wadi Howar, was inhabited by pastoralists whose herds mainly consisted of cattle (Pöllath & Peters 2007; Pöllath, in prep.). Cattle were the most important source of animal protein. The size of the site and the amount of finds (pottery, stone tools, graves, bones)

suggest that it was inhabited repeatedly for longer periods in the year. Merimde-Benisalame was a permanently inhabited Neolithic site situated on the westernmost branch of the Nile in the Delta and contemporaneous with phase III. Besides herding and hunting its inhabitants also practised fishing, which contributed considerably to their diet (von den Driesch & Boessneck 1985). Since the majority of the sites discussed here did not yield bones of aquatic animals (fish, turtles, freshwater mussels) due to environmental reasons, this category was excluded from the analysis. The same holds true for Fayum, Qarun 1, where livestock built the mainstay of the animal food economy if fish was excluded. This site, also contemporary with phase III, was inhabited temporarily implying that the people in the Fayum Oasis were more mobile than those at Merimde (Hassan 1986).

Finally, both sites of composition type 4 belong to phase IV: Dachla 99/38 and El Kharafish 02/5. Their chronological and spatial circumstances show further similarities: Both are situated in the vicinity of the Dakhla Oasis and date to the first half of the 3rd millennium BC. Strong relations exist to the oasis for both sites evidenced by the pottery and other finds. Although livestock keeping has already been an important part of the food economy for the indigenous oasis dwellers (McDonald 1998), the inhabitants of both desert sites nevertheless mainly lived on meat from game. As said, the reasons for this may differ for both sites: the environment around Dachla 99/38 may have been too unfavourable for livestock keeping and the activities of its occupants may not have allowed looking after cattle, sheep and goats. For El Kharafish 02/5 it is imaginable that gazelles were so abundant during the stay of the people there that hunting was not very time-consuming and saved sheep, goat and/or cows for milking. However, the considerable amount of smaller carnivores (18 % for El Kharafish 02/5 and 25.7 % for Dachla 99/38) does not fit into the picture of subsistence-based hunting. The meat of carnivores must be considered an occasional addition to the diet as evidenced by the assemblages of the other composition types since their meat is not regarded as tasty. If so, there must be another explanation for this higher portion of small carnivores' bones at these two sites. In this case hunting for furs is a possible explanation.

In order to survey this in more detail the skeletal distribution of the bone finds was examined (**Tab. 5**). The skeletal elements were not listed according to their anatomical position but according to their treatment when the carcass is skinned. If an animal is hunted for consumption and dismembered in the settlement, fragments of all body parts are usually present. Animals solely hunted for their furs are usually skinned on the killing-site and only the furs are brought to the place where it is further processed and/or traded. Bones remaining in the fur are parts of the skull, the vertebrae of the tail (caudal vertebrae), and, in particular, the bones of the paws (metapodials, sesamoids, phalanges) (see for example the fox bone assemblages from Haithabu, Germany: Reichstein 1984). Bones usually discarded are the elements of the trunk (cervical, thoracic, lumbar vertebrae, sacrum, ribs), limb bones (scapula, pelvic bones, humerus, femur, radius, ulna,

	El Kharafish 02/5	Merimde Foxes	Millbridge, Hertford	El Kharafish 02/5 Gazelles	Merimde
skull	4	6	3	31	30
caudal vertebrae	1	-	10	10	-
metapodials	2	4	16	29	24
sesamoids	-	-	-	1	-
Phalanx 1	2	4	2	4	12
Phalanx 2	-	5	2	3	11
Phalanx 3	-	-	-	2	8
bones remaining in the fur	9 30.0 %	19 70.4 %	33 94.3 %	80 64.0 %	85 64.9 %
trunk	16	3	-	23	17
forelimb	3	2	-	12	12
hindlimb	2	2	1	6	15
carpals, tarsals		1	1	4	2
bones removed from fur	21 70.0 %	8 29.6 %	2 5.7 %	45 36.0 %	46 35.1 %
Total	30	27	35	125	131

Tab. 5 Distribution of skeletal elements of foxes and gazelles from El Kharafish 02/5, Merimde, and Millbridge, Hertford (UK).

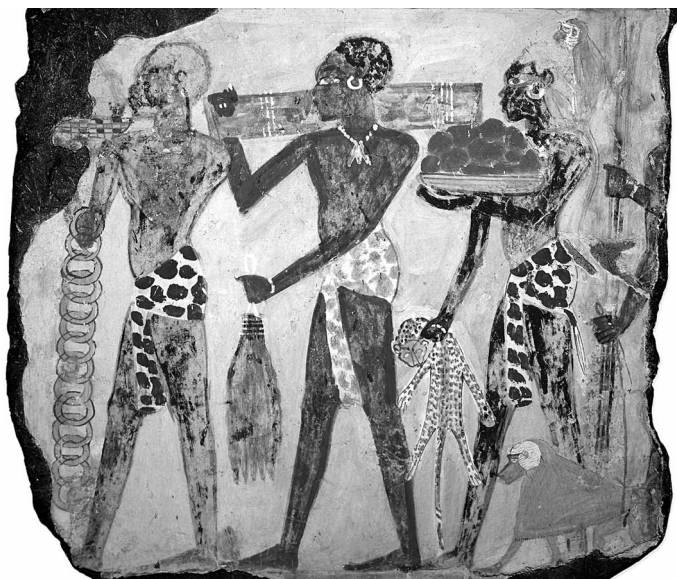
tibia, fibula) and bones of the basipodium (carpals and tarsals). This division was also applied to the gazelle remains, although in gazelles bones of the feet, the tail and the skull usually did not remain in the skin if the hide was turned into leather. If this holds true, it can be expected to find deviant representations of skeletal elements in gazelles and carnivores. Two sites were added to the table as comparatives: the Neolithic site of Merimde mentioned above as a site representative for a farming community, and Millbridge, a Norman-Saxon site in England, where fur-trade could be evidenced on the basis of the archaeozoological record (Baxter & Hamilton-Dyer 2003).

If we first focus on the skeletal distribution of gazelles at Merimde and El Kharafish 02/5, a good congruence can be observed (**Tab. 5**). All elements are more or less equally frequent on both sites, implying that utilisation as well as hunting and butchering techniques were quite similar. Since all body parts are present it can be assumed that carcasses of gazelles were brought to the settlement and dismembered there. Major differences become visible when looking at the distribution patterns of fox bones. Starting with the foxes from Merimde, the representation of body parts shows a similar pattern

as that of the gazelles with 70 % of the bones categorised as 'bones remaining in the fur'. Foxes were obviously dismembered in the settlement and their bones ended up with the normal kitchen refuse of the community. The skeletal distribution of fox bones at El Kharafish 02/5 shows a converse pattern with 30 % bones that remain in the fur and 70 % bones that are usually discarded after skinning. If our assumptions can be regarded as valid, this means that the prehistoric hunters skinned foxes at El Kharafish, dumped the carcasses there and only took the furs with the bones remaining in the raw skins (paw, tail, skull) with them. Finally, the Millbridge example exhibits the other extreme: bones taken away with the furs (94.3 %) outnumber those usually left on the killing-site (5.7 %). Consequently, Baxter & Hamilton-Dyer (2003) interpret this site as a place where traded furs were delivered and processed to the effect that the paws with the bones were dumped. Hence El Kharafish 02/5 and Millbridge can be regarded as representing the two opposite parts of the same procedure: the first is an example of the kill site where the bagged animals were skinned, and the latter an example of the place where traded furs were processed. Merimde, finally, can be regarded as an instance for a place where the animals were skinned and their meat and/or furs were treated afterwards. Dachla 99/38 belongs most likely to the same site category as El Kharafish 02/5, although a statistical analysis was not possible for this site. However, thin cut marks on a second phalanx from a caracal, *Caracal caracal*, give direct evidence for skinning (Riemer et al. 2005). To conclude, this analysis shows that the (seasonal) occupants of El Kharafish 02/5, and most likely Dachla 99/38 as well, practised hunting not only to secure meat supply but also to bag fur-bearing animals and to take their skins back to their (permanent) settlement or to trade them.

At first glance this does not seem a very exciting conclusion, but it marks a rather prominent change in economic activities: from hunting as a method to meet the food demands of the group to specialised hunting to produce surplus that can be traded. Ancient Egyptian written sources corroborate this result, for example the well known 'Tale of the Eloquent Peasant' dating to the Middle Kingdom (Kurth 2003). This story reports that an inhabitant of the Wadi el Natrun loaded his donkeys with all goods he wanted to trade off in the Nile Valley for grain to feed his family. This peasant obviously lived in an environment where grain did not grow in sufficient quantities. Among the goods that were looked for in the Nile Valley and provided by the peasant, there were several minerals, plants, wood, gutted fishes and birds as well as furs of leopards and jackals. Several mural scenes also emphasise the meaning of and need for furs in the ancient Egyptian society, e.g., when Nubians deliver skins of carnivores as shown in the tomb of Sobekhotep, Thebes (18th dynasty) (Fig. 6) or in the tomb of Rekhmire, a vezier during the reign of Thutmose III and Amenhotep II (Hodel-Hoernes 1991: figs. 55, 56). The official attire of the Sem priests, a leopard skin with the bones of the head, tail and paws left in the skin, is a further confirmation of the importance of complete carnivores' skins (Hodel-Hoernes 1991: figs. 46–48 [tomb of Sennefer]; fig. 94 [tomb of Sennedjem]). The tale of the peasant and the depictions may offer the key to the understanding of El Kharafish. It seems likely that the people

Fig. 6 Nubians bringing luxury items including a leopard skin. Fragment of painted plaster from the tomb of Sobekhotep, Thebes (18th dynasty). Courtesy of the British Museum, London (inv. EA 922).



visiting El Kharafish did exactly what the peasant did: They hunted birds and they skinned fur-bearing carnivores, and they may have also collected minerals and particular plants to trade with the Egyptians either in the oasis or – given the distance maybe less likely – in the Nile Valley. Similar assumptions may be valid for the gazelles hunted at El Kharafish: The meat of gazelles certainly served as food for the hunters during their stay, but it may also have been dried and taken to the oasis.

7. Conclusions

Small gazelles, dorcas and/or slender-horned gazelle, were the most frequent species in the game bag of the prehistoric hunters of the Western Desert. Hare, dama gazelle and scimitar-horned oryx follow in varying orders. Addax, Barbary sheep and ostrich are rare during all four phases and are not of great economic importance. Apart from bovids, carnivores are the second most important mammal group evidenced in the faunal remains. Their numbers are low in general, with the exception of two assemblages in the youngest phase.

Since no major changes are observable from the first to the fourth phase, no anthropogenic impact on the native fauna could be ascertained. If there was an anthropogenic influence on the composition of the fauna, it most likely impacted the region in the vicinity of the Nile Valley where hunting pressure was certainly higher than in the true desert.

However, from this region no faunal assemblages are known. The preponderance of small gazelles and hare as well as the rareness of addax and oryx could be traced back to the hunting techniques of the prehistoric desert dwellers. They obviously preferred territorial species since these were a more predictable game than migratory species.

During the first three phases hunting was the core activity to secure the meat supply for the human groups. Only in the Nabta Playa/Bir Kiseiba region meat of livestock supplemented and gradually replaced meat of game, a process probably starting already in the first phase. The role of hunting for human subsistence changed fundamentally in the fourth phase, which covers the historic periods when the ancient Egyptian depictions that started the discussion had been created. Oasis dwellers went to the desert to capture fur-bearing animals (mostly foxes), birds, and gazelles (El Kharafish 02/5). Furs and maybe also dried meat were taken as a surplus that could be traded for other goods, as it is suggested by written sources from the Middle Kingdom ('The Tale of the Eloquent Peasant') and a number of relevant depictions. The analysis of other settlements or (temporary) site occupations of the youngest phase (Jaquab 99/31, Dachla 99/38) showed that hunting was an opportunistic activity for their inhabitants to supplement their diet with fresh meat. If hunting was practised as an opportunistic activity, territorial species are even more appropriate since their habits and preferred whereabouts are better to explore. This assures hunting success without much effort compared to the effort necessary when stalking or driving migratory species.

The starting point of this workshop was the question if the ancient Egyptian depictions of desert hunts, and of desert animals kept in confinement and sacrificed in temples can be understood as reflections of the reality. The archaeozoological record from Egypt's Western Desert does help little to answer this question. There are no obvious findings, no sites, and no evidence in the faunal material that proves that the ancient Egyptians captured large herds of desert animals that were then driven to the Nile Valley. The assemblages from the first three phases mirror the subsistence strategies of people roaming the desert with hunting as the core activity to secure their animal protein supply. A drastic change occurred in the fourth phase: Groups of hunter-gatherers no longer roamed the desert, and the oasis and Nile Valley dwellers became (agro-)pastoralists. However, the desert was not completely devoid of people in that time. New types of settlements were established: watch posts (Dachla 99/38), resting stations along the trading routes through the desert (Jaquab 99/31), and short-termed camping sites of people from the oases (El Kharafish 02/5). The faunal material from the latter shows a shift in the role of hunting for people during Dynastic times. These people mainly lived on livestock keeping, but now visited the desert for specialised hunts to provide the inhabitants of the oases and/or the Nile Valley with the gifts of the desert. There obviously was a 'market' for these products. In this regard, the ancient Egyptian depictions of desert animals might mirror not only idealised traditions but also the real demand for the products of the arid wilderness.

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References

- Baxter, I.L. & S. Hamilton-Dyer
2003 Foxy in furs? A note on evidence for the probable commercial exploitation of the red fox (*Vulpes vulpes* L.) and other fur bearing mammals in Saxo-Norman (10th–12th century AD) Hertford, Hertfordshire, U.K. *Archaeofauna* 12: 87–94.
- Berke, H.
2001 Gunsträume und Grenzbereiche. Archäozoologische Beobachtungen in der Libyschen Wüste im Sudan und Ägypten. In: B. Gehlen, M. Heinen & A. Tillmann (eds.), *Zeit-Räume. Gedenkschrift für Wolfgang Taute. Archäologische Berichte* 14 (Bonn: Deutsche Gesellschaft für Ur- und Frühgeschichte) 238–256.
- Brewer, D.
1989 Fishermen, Hunters and Herders. *Zooarchaeology in the Faiyum, Egypt*. BAR, International Series 478 (Oxford: BAR).
- Clayton, J., A. De Trafford & M. Borda
2008 A Hieroglyphic Inscription found at Jebel Uweinat mentioning Yam and Tekhebet. *Sahara* 19: 129–134.
- Clutton-Brock, J.
1987 *A natural history of domesticated mammals* (Cambridge: University Press).
- von den Driesch, A. & J. Boessneck
1985 *Die Tierknochenfunde aus der neolithischen Siedlung von Merimde-Benissalâme am westlichen Nildelta* (München: Uni-Druck).
- Fäder, E.
2005 At the foot of the northern blocking dune. Wadi Bakht 82/22. In: J. Linstädter (ed.), *Wadi Bakht. Landschaftsarchäologie einer Siedlungskammer im Gilf Kebir*. *Africa Praehistorica* 18 (Köln: Heinrich-Barth-Institut) 169–211.
- Förster, F.
2007a The Abu Ballas Trail: a Pharaonic donkey-caravan route in the Libyan Desert (SW-Egypt). In: O. Bubbenzer, A. Bolten & F. Darius (eds.), *Atlas of Cultural and Environmental Change in Arid Africa*. *Africa Praehistorica* 21 (Köln: Heinrich-Barth-Institut) 130–133.
2007b With donkeys, jars and water bags into the Libyan Desert: the Abu Ballas Trail in the late Old Kingdom/First Intermediate Period. *British Museum Studies in Ancient Egypt and Sudan* 7: 1–36.
- Gautier, A.
1980 Contributions to the archaeozoology of Egypt. In: F. Wendorf & R. Schild (eds.), *Prehistory of the Eastern Sahara. Studies in archaeology* (New York: Academic Press) 317–344.

- 1984 Archaeozoology of the Bir Kiseiba region, Eastern Sahara. In: F. Wendorf, R. Schild & A. Close (eds.), *Cattle-keepers of the Eastern Sahara* (Dallas: Southern Methodist University Press) 49–72.
 - 1993 The faunal spectrum of the Middle Palaeolithic in Bir Tarfawi, Western Desert of Egypt. In: L. Krzyżaniak, M. Kobusiewicz & J. Alexander (eds.), *Environmental change and human culture in the Nile basin and northern Africa until the second millennium B.C.* Studies in African Archaeology 4 (Poznań: Poznań Archaeological Museum) 123–128.
 - 2001 The early to late Neolithic archeofaunas from Nabta and Bir Kiseiba. In: F. Wendorf & R. Schild (eds.), *Holocene settlement of the Egyptian Sahara. Vol. 1: The Archaeology of Nabta Playa* (New York: Kluwer Academic/Plenum Publishers) 609–635.
 - 2007 Animal domestication in North Africa. In: M. Bollig, O. Bubbenzer, R. Vogelsang & H.-P. Wotzka (eds.), *Aridity, change and conflict in Africa. Proceedings of an International ACACIA Conference held at Königswinter, Germany October 1–3, 2003. Colloquium Africanum 2* (Köln: Heinrich-Barth-Institut) 75–90.
- Gehlen, B., K. Kindermann, J. Linstädter & H. Riemer
- 2002 The Holocene Occupation of the Eastern Sahara: Regional Chronologies and Supra-regional Developments in Four Areas of the Absolute Desert. In: Jennerstr. 8 (eds.), *Tides of the Desert – Gezeiten der Wüste. Contributions to the archaeology and environmental history of Africa in honour of Rudolph Kuper. Africa Praehistorica 14* (Köln: Heinrich-Barth-Institut) 85–116.
- Haltenorth, T. & H. Diller
- 1977 *Säugetiere Afrikas und Madagaskars. BLV Bestimmungsbuch* (München/Bern/Wien: BLV).
- Happold, D.C.D.
- 1987 *The mammals of Nigeria* (Oxford: Oxford University Press).
- Hassan, F.
- 1986 Holocene Lakes and Prehistoric Settlements of the Western Faiyum, Egypt. *Journal of Archaeological Science* 13: 483–501.
 - 2000 Climate and cattle in North Africa. A first approximation. In: R.M. Blench & K.C. MacDonald (eds.), *The Origins and Development of African Livestock: Archaeology, genetics, linguistics and ethnography* (London/New York: Routledge) 61–86.
- Hodel-Hoernes, S.
- 1991 *Leben und Tod im Alten Ägypten. Thebanische Privatgräber des Neuen Reiches* (Darmstadt: Wissenschaftliche Buchgesellschaft).
- Hofmann, B.
- 2000 Zur Bedeutung der Wüste im pharaonischen Ägypten. In: U. Lindemann & M. Schmitz-Emans (eds.), *Was ist eine Wüste? Interdisziplinäre Annäherungen an einen interkulturellen Topos. Saarbrücker Beiträge zur Vergleichenden Literatur- und Kulturwissenschaft 12* (Würzburg: Königshausen & Neumann) 17–27.
- Jesse, F., S. Kröpelin, M. Lange, N. Pöllath & H. Berke
- 2004 On the periphery of Kerma. The Handessi Horizon in Wadi Hariq – Northwestern Sudan. *Journal of African Archaeology* 2: 123–164.
- Kaper, O.E. & H. Willems
- 2002 Policing the Desert: Old Kingdom Activity around the Dakhleh Oasis. In: R. Friedman (ed.), *Egypt and Nubia: Gifts of the Desert* (London: British Museum Press) 79–94.
- Kitagawa, C.
- 2008 On the presence of deer in Ancient Egypt. Analysis of the osteological record. *Journal of Egyptian Archaeology* 94: 209–222.

- Kuper, R.
 2006 An attempt at structuring the Holocene occupation of the Eastern Sahara. In: K. Kroeper, M. Chłodnicki & M. Kobusiewicz (eds.), *Archaeology of Early Northeastern Africa. In Memory of Lech Krzyżaniak. Studies in African Archaeology 9* (Poznań: Poznań Archaeological Museum) 261–272.
- Kuper, R & S. Kröpelin
 2006 Climate-Controlled Holocene Occupation in the Sahara: Motor of Africa's Evolution. *Science* 313: 803–807.
- Kuper, R., H. Riemer, S. Hendrickx & F. Förster
 2003 Preliminary Report on the Field Season 2002 of the ACACIA Project in the Western Desert.
 < www.uni-koeln.de/sfb389/a/a1/download/acacia%20A1-E3_report%202002.pdf > (01-07-2009).
- Kurth, D.
 2003 Der Oasenmann. Eine altägyptische Erzählung übersetzt und kommentiert von D. Kurth. *Kulturgeschichte der Alten Welt* 103 (Mainz am Rhein: Philipp von Zabern).
- Manlius, N.
 2000 Did the Arabian Oryx live in Egypt during Pharaonic times? *Mammal Review* 30(1): 65–72.
- Marshall, F.
 2007 African pastoral perspectives on domestication of the donkey: A first synthesis. In: I. Vrydaghs, J. Iriate & T.P. Denham (eds.), *Rethinking Agriculture: Archaeological and Ethnoarchaeological Perspectives*. One World Archaeology (London: Left Coast Press) 371–407.
- McDonald, M.M.A.
 1998 Early African pastoralism. View from Dakhleh Oasis (South Central Egypt). *Journal of Anthropological Archaeology* 17: 124–142.
 2002 Dakhleh Oasis in Predynastic and early Dynastic times. Bashendi B and Sheikh Muftah cultural units. *Archéo-Nil* 12: 109–120.
- Newby, J. & T. Wachter
 2008 *Addax nasomaculatus*. In: IUCN (International Union for Conservation of Nature), IUCN Red List of Threatened Species, Version 2008. < www.iucnredlist.org/details/512 > (15-03-2009).
- Newby, J., T. Wachter, Lamarque, F. Cuzin & K. De Smet
 2008 *Nanger dama*. In: IUCN (International Union for Conservation of Nature), IUCN Red List of Threatened Species, Version 2009.1. < www.iucnredlist.org/details/8968/0/full > (01-07-2009).
- Osborn, D.J. & I. Helmy
 1980 The contemporary land mammals of Egypt (including Sinai). *Fieldiana: Zoology N.S.* 5 (Chicago: Museum of Natural History).
- Pöllath, N.
 2010 Prähistorische und rezente Fauneninventare vom Abu-Muharik-Plateau. In: K. Kindermann, Djara. Zur mittelholozänen Besiedlungsgeschichte zwischen Niltal und Oasen (Abu-Muharik-Plateau, Ägypten). *Africa Praehistorica* 23 (Köln: Heinrich-Barth-Institut) 837–858.
- Pöllath, N. & J. Peters
 2007 Holocene climatic change, human adaptation and landscape degradation in arid Africa as evidenced by the faunal record. In: O. Bubenzer, A. Bolten & F. Darius (eds.), *Atlas of Cultural and Environmental Change in Arid Africa. Africa Praehistorica* 21 (Köln: Heinrich-Barth-Institut) 64–67.

Reichstein, H.

- 1984 Beitrag zur Kenntnis frühmittelalterlicher Rotfüchse, *Vulpes vulpes* (Linné, 1758) aus Schleswig-Holstein. Schriften aus der Archäologisch-Zoologischen Arbeitsgruppe Schleswig-Kiel 8 (Kiel: Institut für Haustierkunde der Universität Kiel).

Riemer, H.

- 2000 Regenfeld 96/1 – Great Sand Sea and the question of human settlement on whaleback dunes. In: L. Krzyżaniak, K. Kroeper & M. Kobusiewicz (eds.), *Recent Research into the Stone Age of Northeastern Africa. Studies in African Archaeology 7* (Poznań: Poznań Archaeological Museum) 21–31.
- 2003 The “Re-conquest” of the Great Sand Sea. In: Z. Hawass & L. Pinch Brock (eds.), *Egyptology at the Dawn of the Twenty-First Century. Proceedings of the Eighth International Congress of Egyptologists, Cairo 2000. Vol. 1: Archaeology* (Cairo: American University in Cairo Press) 408–415.
- 2004 Holocene game drives in the Great Sand Sea of Egypt? Stone structures and their archaeological evidence. *Sahara* 15: 31–42.
- 2005 Pastoralism and the ‘absolute’ desert. A view from the southern Great Sand Sea, Egypt. In: B. Barich, T. Tillet & K.H. Striedter (eds.), *Hunters vs. Pastoralists in the Sahara: Material Culture and Symbolic Aspects. Actes du XIV^{ème} Congrès UISPP, Université de Liège, Belgique, 22–8 September 2001. BAR International Series 1338* (Oxford: Archaeopress) 57–65.
- 2007 When hunters started herding: Pasto-foragers and the complexity of Holocene economic change in the Western Desert of Egypt. In: M. Bollig, O. Bubenz, R. Vogelsang & H.-P. Wotzka (eds.), *Aridity, Change and Conflict in Africa. Proceedings of an International ACACIA Conference held at Königswinter, Germany October 1–3, 2003. Colloquium Africanum 2* (Köln: Heinrich-Barth-Institut) 105–144.

Riemer, H., F. Förster, S. Hendrickx, S. Nussbaum, B. Eichhorn, N. Pöllath, P. Schönfeld & G. Wagner

- 2005 Zwei pharaonische Wüstenstationen südwestlich von Dachla. *Mitteilungen des Deutschen Archäologischen Instituts, Abteilung Kairo* 61: 291–350.

Riemer, H., N. Pöllath, S. Nussbaum, I. Teubner & H. Berke

- 2008 El Kharafish. A Sheikh Muftah desert camp site between the oasis and the Nile. In: B. Midant-Reynes, Y. Tristant, J. Rowland & S. Hendrickx (eds.), *Egypt at its origins 2. Proceedings of the International Conference “Origin of the State. Predynastic and Early Dynastic Egypt”, Toulouse (France), 5th–8th September 2005. Orientalia Lovaniensia Analecta 172* (Leuven: Peeters Publishers) 585–608.

Schönfeld, P.

- 2007 Wegstationen auf dem Abu Ballas Trail. Dynastische Fundplätze aus der Western Desert Ägyptens. *Archäologische Informationen* 30(1): 133–140.

Stiner, M.C., N.D. Munro & T. Surovelli

- 2000 The tortoise and the hare: small-game use, the broad-spectrum revolution and paleolithic demography. *Current Anthropology* 41: 39–73.

Van Neer, W. & H.-P. Uerpmann

- 1989 Palaeoecological significance of the Holocene faunal remains of the B.O.S.-Missions. In: R. Kuper (ed.), *Forschungen zur Umweltgeschichte der Ostsahara. Africa Praehistorica 2* (Köln: Heinrich-Barth-Institut) 308–341.

Wendorf, F. & R. Schild

- 2005 Are the early Holocene cattle in the eastern Sahara domestic or wild? *Evolutionary Anthropology* 3(4): 118–128.